

Announcements

▣ Homework for tomorrow...

Ch. 31: CQ 6, Probs. 10, 16, & 42

CQ11: $R_b < R_c < R_a = R_e < R_d$

30.28: a) $R = 1.5 \, \Omega$ b) $R = 3.5 \, \Omega$

30.34: $I = 1.6 \, \text{A}$

30.58: See solution manual

▣ Office hours...

MW 10-11 am

TR 9-10 am

F 12-1 pm

▣ Tutorial Learning Center (TLC) hours:

MTWR 8-6 pm

F 8-11 am, 2-5 pm

Su 1-5 pm

Chapter 31

Fundamentals of Circuits (*Series Resistors & Real Batteries*)

Review...

Power supplied by a battery...

$$P_{bat} = I\mathcal{E}$$

Power dissipated by a resistor...

$$P_R = I\Delta V_R = I^2 R = \frac{(\Delta V_R)^2}{R}$$

i.e. 31.4:

The Power of Sound

Most loudspeakers are designed to have a resistance of 8Ω .

If an 8Ω loudspeaker is connected to a stereo amplifier with a rating of 100W , what is the maximum possible current to the loudspeaker?

Kilowatt Hours

The energy dissipated by a resistor during time interval Δt is

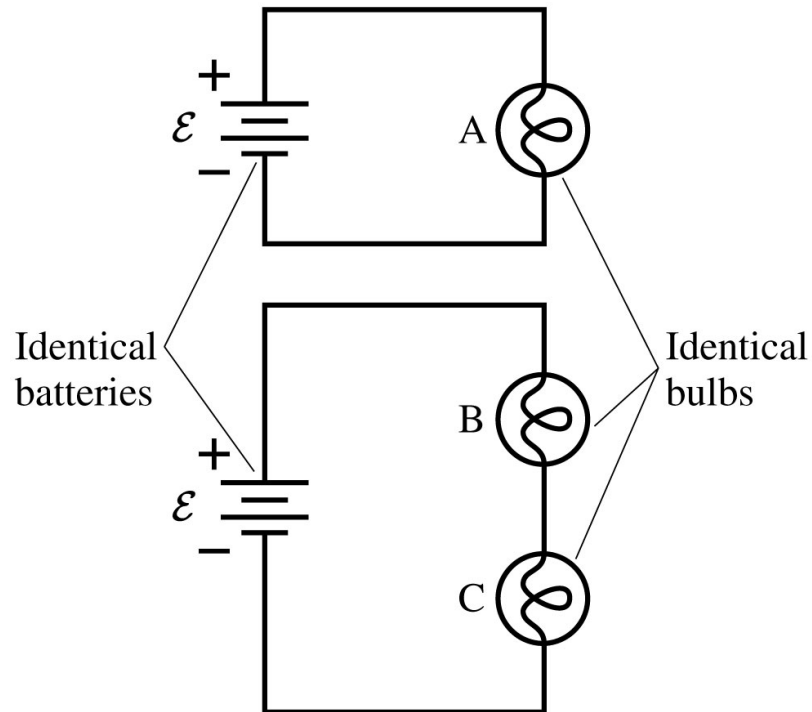
$$E_{th} = P_R \Delta t$$

1 kW•h is equivalent to how many J's?

How long does it take for a 14 W c.f.l. to 'consume' this much energy?

Quiz Question 1

How does the brightness of bulb B compare to that of bulb A ?

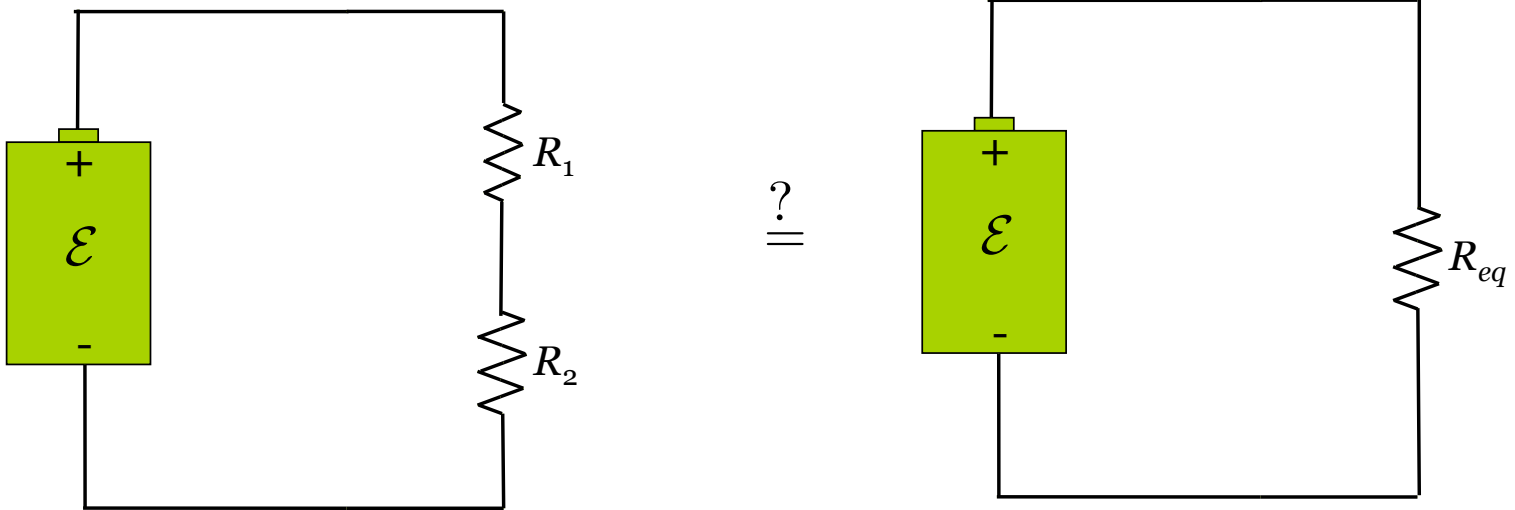


1. Bulb B is brighter.
2. Bulb A is brighter.
3. Both bulbs have the same brightness.

31.4: Series Resistors

Consider two resistors in *series*...

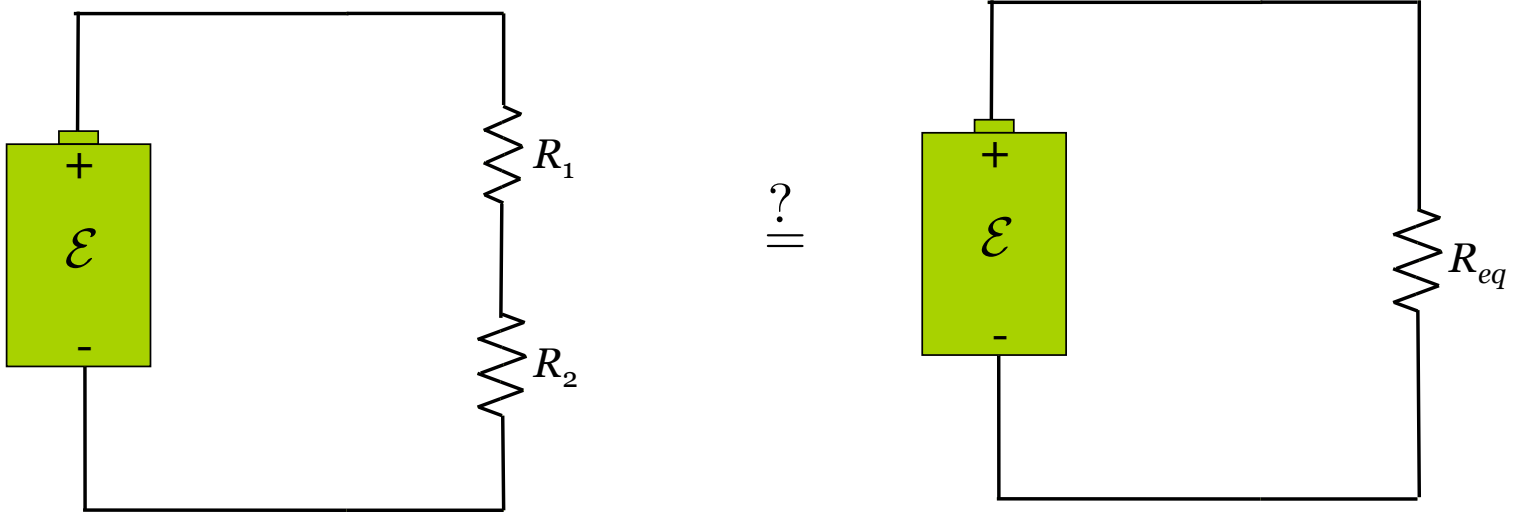
- Can we find an *equivalent resistor*, R_{eq} , to the two resistors, R_1 & R_2 ?



31.4: Series Resistors

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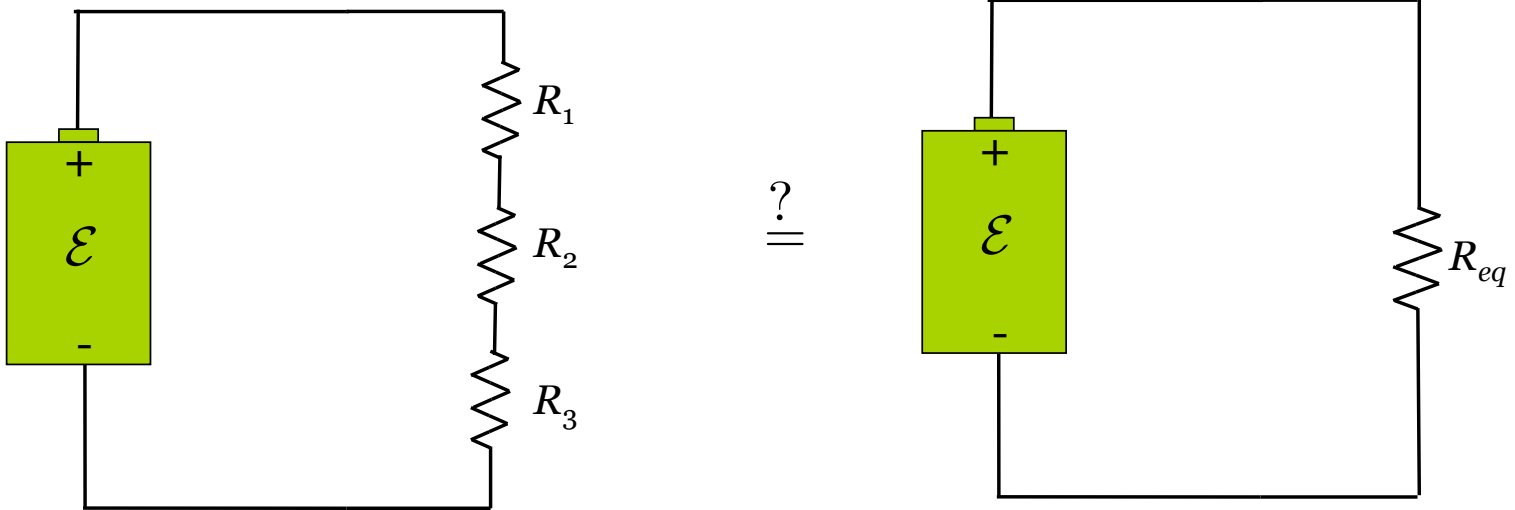
- YES!

$$R_{eq} = R_1 + R_2$$

31.4: Series Resistors

What about several resistors in *series*...

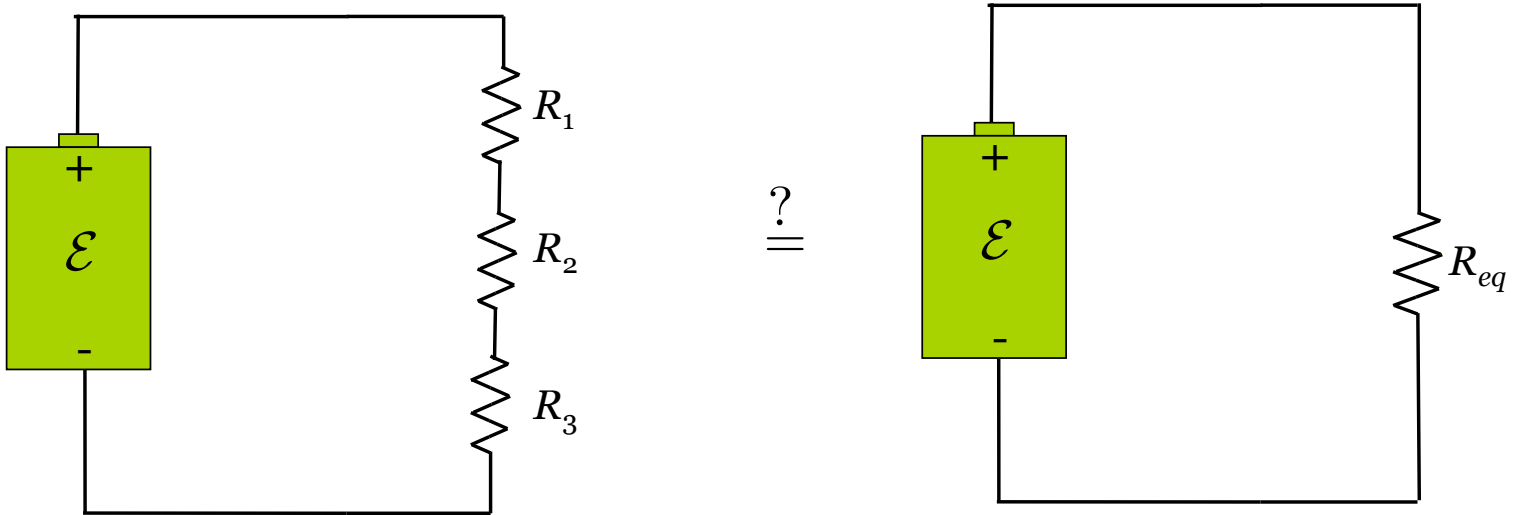
- Can we find an *equivalent resistor*, R_{eq} , to the resistors, R_1, R_2, \dots (all in series)?



31.4: Series Resistors

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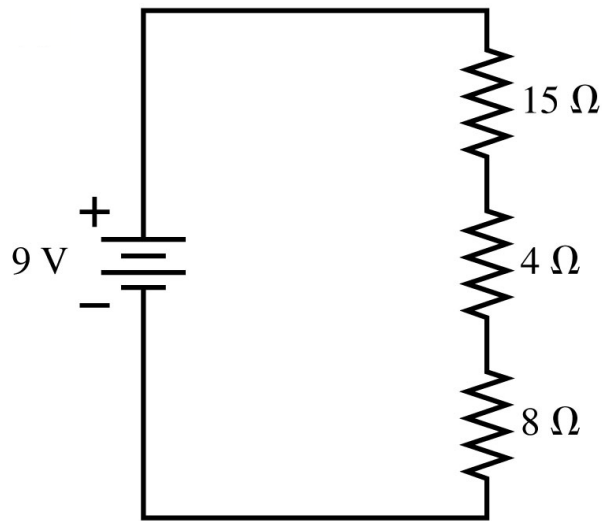
- YES!

$$R_{eq} = R_1 + R_2 + \dots$$

i.e. 31.5:

A series resistor circuit

- What is the current in the circuit below?
- Draw a graph of potential versus position in the circuit, going cw from $V = 0\text{V}$ at the battery's negative terminal.



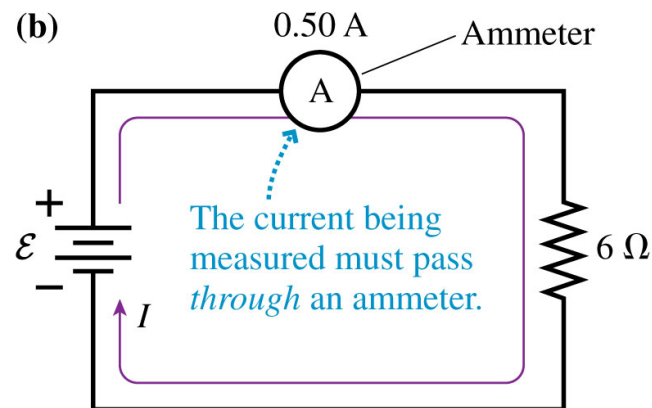
Ammeters...

- are used to measure *currents*.
- must be wired in *series* with the circuit element whose current is to be measured.
- have $R_{\text{ammeter}} \sim 0 \Omega$

(a)



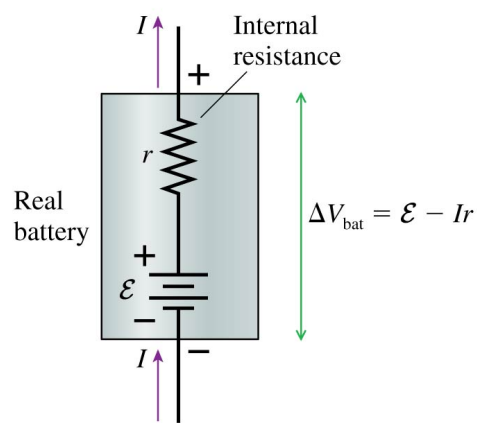
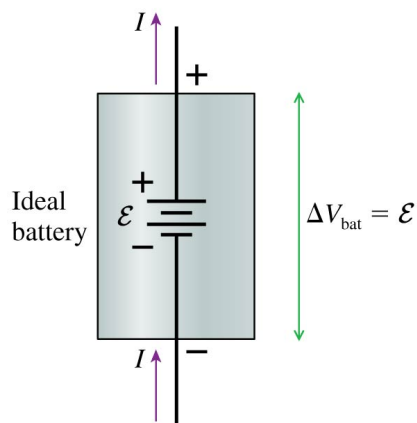
(b)



31.5: Real Batteries

- have an *internal resistance*, r
- The *terminal voltage* is...

$$\Delta V_{bat} = \mathcal{E} - Ir \leq \mathcal{E}$$

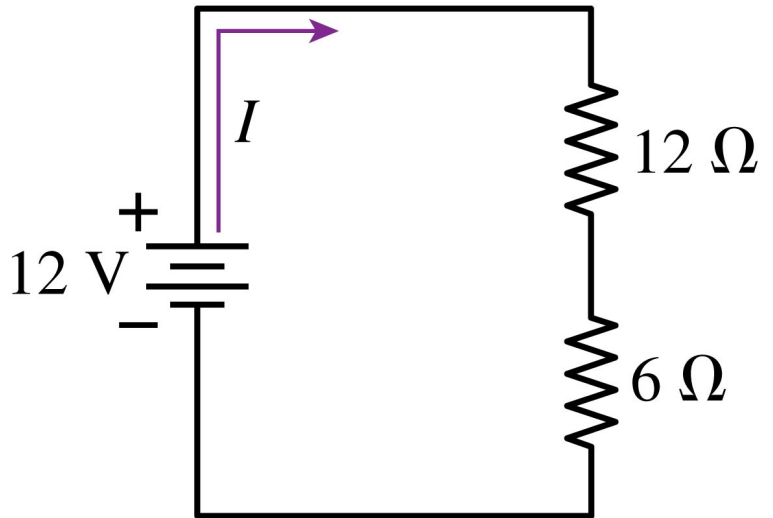


Notice:

- *only* when $I = 0$ is $\Delta V_{bat} = \mathcal{E}$.

Quiz Question 2

The battery current I is



1. 3 A.
2. 1.5 A.
3. 1 A.
4. $2/3$ A.
5. $1/3$ A.

Quiz Question 3

A *real* battery has an *emf*, \mathcal{E} , and a *terminal voltage*, ΔV_{bat} , where $\Delta V_{\text{bat}} < \mathcal{E}$.

The voltage drop across the resistor R is equal to

1. \mathcal{E} .
2. ΔV_{bat} .
3. both.
4. neither.

